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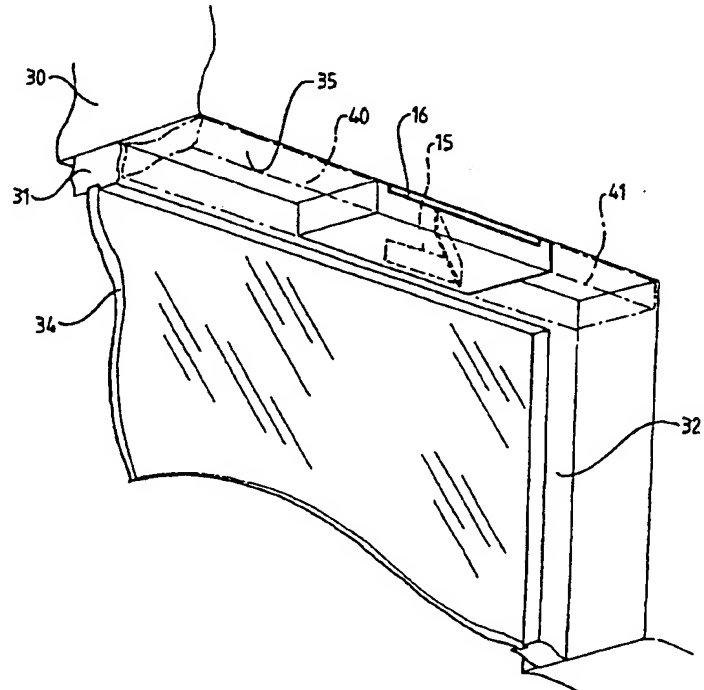
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<p>(21) International Application Number: <b>PCT/GB97/00982</b> (22) International Filing Date: 9 April 1997 (09.04.97) (30) Priority Data: 9607604.7 12 April 1996 (12.04.96) GB (71)(72) Applicant and Inventor: <b>BAKER, Mark [GB/GB]; 55 Crystal Avenue, Stourbridge, West Midlands DY8 4AR (GB).</b> (74) Agent: <b>FORRESTER KETLEY &amp; CO.; Chamberlain House, Paradise Place, Birmingham B3 3HP (GB).</b></p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i></p>

(54) Title: VENTILATION FANS

(57) Abstract

A ventilation fan assembly comprising a housing (10) adapted to be mounted in a reveal (35) of a window of a door adjacent a frame member of a window or door; the housing (10) having aperture means (15, 16) and including fan means (11) for causing air flow through the aperture means (15, 16) and thus air flow in the atmosphere ambient the housing.



Title: VENTILATION FANS

Description of Invention

This invention relates to fans and more particularly to the disposition thereof in relation to an internal space such as a room (and herein termed for convenience a room) of a building, in order to cause flow of air in relation to the room for influencing climatic conditions within the room. Such flow of air, which will herein be referred to as ventilation, will usually comprise a flow of air between the room and the atmosphere outside the room, although it may comprise a circulation or flow within the room not involving flow between the room and the atmosphere outside the room.

Ventilation fans for causing flow of air between the interior of rooms such as kitchens or bathrooms and the external atmosphere are usually mounted either in association with a duct extending through a wall or ceiling of a room and leading to the exterior of the building, or else a fan unit is provided in an aperture in a window of the room. In the former case, such a fan is inconvenient to fit, because modifications to the fabric of the building are required, while in the latter case such a fan is unsightly and reduces the window area.

It has also been proposed, in EP-0458725-A, that a fan can be installed on an openable window sash, and exhaust through the frame of the sash. An elongate cross-flow fan is disclosed for this purpose, or as an alternative axial fans could be utilised. However, such a fan installation also is unsightly and limited in respect of the magnitude of the airflow it can produce.

Accordingly it is an object of the present invention to provide a ventilation fan which overcomes or reduces such problems.

According to one aspect of the invention, I provide a ventilation fan assembly comprising a housing adapted to be mounted in a reveal of a window or door adjacent a frame member of the window or door; the housing having aperture means and including fan means for causing airflow therethrough and thus airflow in the atmosphere ambient the housing.

Preferably the housing has first and second aperture means adapted to lie in communicating relationship respectively with an opening extending through said frame member for airflow therethrough, and with the atmosphere ambient the housing, the fan means being arranged to cause airflow between said first and second aperture means.

According to another aspect of the invention, I provide an installation of a ventilation fan assembly in association with a window or door, the window or door having a peripheral frame disposed in a wall and providing a reveal; the ventilation fan assembly comprising a housing disposed in said reveal adjacent a member of said peripheral frame and having aperture means and fan means for causing air flow therethrough and thus for causing airflow in the atmosphere ambient the housing.

Preferably the frame member has an opening extending through it between opposite faces of the window or door, and the fan assembly housing comprises first and second aperture means respectively in communicating relationship with said opening and with the atmosphere ambient the housing, the fan means being operable to cause airflow between said first and second aperture means and thus between the atmosphere ambient the housing and that at the opposite face of the window or door.

Preferably the housing has dimensions such that it fits in the reveal of the window or door adjacent the frame member and does not extend into the window or door area more than does the frame member.

Thus in the case of a window the glass area is not reduced by the fitting of a ventilation fan in accordance with the invention.

The housing may be or include a trough-like member having an open upper part which, when installed, is closed by the reveal of the window or door. In this case, establishment of an appropriate path for flow of air through the housing depends on airtight or substantially airtight installation of the housing in the reveal. Alternatively, there may be a closure member for closing the upper part of the trough-like member, so that such airtight installation is not significant.

There may be a cover member which is removably fitted to the housing, and which provides an appearance (in respect of shape and/or finish) which is adapted to be compatible with the window or door in relation to which the fan assembly is installed. Such cover member may afford when fitted, at least one path for flow of air.

Preferably the fan means comprises at least one centrifugal fan, the or each thereof including a rotary element which is of relatively large diameter, but small height, and which rotates about an axis parallel or substantially parallel to the plane of the window and perpendicular to the reveal thereof.

The or each fan preferably operates on a low voltage electrical power supply, e.g. twelve volts. This facilitates installation of the fan in, for example, a bathroom, without requiring stringent safety precautions such as are necessary if an item of electrical equipment operating at mains voltage is thus installed. The electrical power supply for such a low voltage fan may be derived from a transformer located at any convenient position in a building. A further possibility in the case of a fan operating on a low voltage electrical power supply is that it is able to be operated from a battery or batteries, e.g. rechargeable, which may be disposed in or in association with the housing of the fan assembly.

When the fan assembly in accordance with the invention incorporates two or more fans, they may be arranged to cause flow of air in the same sense (i.e. inwardly or outwardly relative to the window) as one another, to provide a greater airflow than can be achieved by a single fan. Alternatively, fans arranged to cause airflow in opposite senses from one another may be utilised, so that by selection of one or other of the fans airflow in the required direction may be achieved.

It will be appreciated that centrifugal fans such as are preferably used in an assembly in accordance with the invention are not reversible in respect of the direction of the airflow they cause by reversal of their direction of rotation. Thus reversal of the direction of ventilation airflow is preferably achieved by the use of two fans connected in different senses to the aperture means of the

assembly, although it would nevertheless be within the broadest aspect of the invention to provide for reversal of direction of airflow by the use of adjustable baffles, shutters, or the like to cause air to flow in a different path through the housing in relation to a single fan.

Whilst it is preferred that a fan assembly in accordance with the invention provides for airflow between the interior of a room and the exterior thereof, it would alternatively or in addition be possible for the fan assembly to provide for airflow within the room only, by causing circulation of air from the room, through the assembly, and back to the room. The assembly may incorporate filter means or other means for treating the air thus circulated, whereby atmospheric conditions within a room can be affected without an external air flow. These and other possibilities which may be provided in the invention are described in greater detail hereafter.

The invention will now be described by way of example with reference to the accompanying drawings, of which:-

Figure 1 is a perspective view of an embodiment of ventilation fan assembly in accordance with the invention;

Figure 2 is a perspective view, from beneath, of a fan assembly as installed in relation to a window;

Figure 3 is a section through the installation shown in Figure 2;

Figure 4 is a perspective view of a further embodiment of fan assembly in accordance with the invention;

Figure 5 is a perspective view of yet a further embodiment of fan assembly in accordance with the invention.

Referring firstly to Figure 1 of the drawings, a ventilation fan assembly comprises a housing indicated generally at 10 containing a fan unit 11. The housing 10 includes a trough-like member which is generally of U-shape in cross-section comprising a base 12 and upstanding side walls 13, 14 extending from the base. This member may be of plastics material, being either a moulding or an appropriate length of an extrusion of the material, or may be metal. The wall 14

has an elongate, slot-like outlet aperture 15 therein, while the wall 13 is of lower height than the wall 14 so as to define, when installed as described hereafter, an elongate slot-like inlet aperture 16 visible in Figure 2. The fan unit 11 is in the illustrated embodiment disposed towards one end of the housing 10 and at the opposite end the housing has an end wall 17. Within the housing, a baffle structure defined by a wall 18 extends diagonally across the housing to define a generally triangular airflow passage leading from an outlet of the fan unit 11 to the outlet aperture 15.

The fan unit 11 is a centrifugal fan unit including a rotary element of relatively large diameter but low height, which in use rotates about an axis parallel to the walls 13, 14. An inlet to the fan is indicated at 19, and in use the fan draws air through the inlet aperture 16 into the interior of the housing 10, then through the inlet 19 to the fan itself, and expels air through the passage defined by the baffle wall 18 towards and through the outlet aperture 15. The inlet and outlet flows of air are indicated by arrows 20, 21 respectively. The fan unit 11 is preferably driven by a low voltage electric motor operating at a supply voltage of, e.g. twelve volts.

Figures 2 and 3 show a fan assembly generally as described in relation to Figure 1, installed in relation to a window. These figures show part of a wall 30 with an opening therein in which is disposed a window having a peripheral frame including frame members 31, 32, 33. A glazing panel is indicated at 34. The installation of the frame of the window in the opening of the wall leaves a reveal 35 in which a fan assembly as above described may be installed.

Figure 2 shows a fan assembly thus installed, the fan assembly being similar to that shown in Figure 1, but different in respect of the layout in its internal components. Inlet and outlet apertures 16, 15 are present as above described, and the fan assembly is installed by fixing the housing of the fan assembly to the frame member 31 and/or to the reveal 35, with the wall 14 of the housing of the fan assembly in close face-to-face relationship with a facing surface of the frame member 31. The outlet aperture 15 is aligned with an opening 36

extending through the frame member between opposite faces of the window. The housing 10 may be closed at its upper surface by virtue of its contact with the reveal 35, or a separate closure member could be provided. When the fan unit 11 operates, air is drawn from the atmosphere ambient the housing 10, and expelled at the opposite face of the window by way of the opening 36 in the frame member of the window.

It will be noted that the height of the housing of the fan assembly is of the same order as that of the frame member 31 of the window, and thus the presence of the housing does not detract from the sightline through the window. Although as illustrated the fan assembly is mounted in the reveal of the window adjacent one end thereof, it could be installed in any appropriate position relative to the window having regard to aesthetic and practical considerations. The housing of the assembly might be extended by the fitting of further elongate cover members to the assembly illustrated, so that a housing is provided which extends across the entire width of a window thereby, in some circumstances, rendering the housing even less intrusive in appearance. Such extended cover members are indicated at 40, 41 in Figure 3.

In Figures 2 and 3, the window frame members are shown as being solid components, e.g. of timber. It will be appreciated that the invention is usable in connection with frame members of extruded plastics, e.g. UPVC material: such frame members characteristically have a hollow interior and are of sufficient dimensions for apertures to be provided in opposed side portions of the frame member to provide an opening large enough for a substantial flow of air therethrough.

Referring now to Figure 4 of the drawings, this shows an embodiment comprising a housing 50 which may be fabricated from sheet metal by a succession of appropriate manufacturing operations which, for example, may include cutting, pressing, bending, and joining, e.g. by welding, rivetting or the use of adhesives. The housing comprises a portion 51 which is adapted to receive a fan unit such as above described, and a portion 52 which extends from the portion

51 and tapers in respect of its lateral dimension and has an elongate slot-like aperture 53 in its front wall 54. The portion 51 has an opening 55 providing for flow of air into the inlet of a fan unit (not shown) received in the portion 51. The housing 50 is adapted to be secured to the reveal of a window or door and/or to a frame member thereof, generally as above described.

The assembly further comprises a cover member which is a generally L-section plastics or metal member, part of which is shown in broken lines at 56. It is arranged to be removably secured by suitable fastening means to the housing 50 and is of a shape such as to define between itself and the housing 50 a passage for flow of air as indicated by arrows 57 to the opening 55 leading to the fan unit. An appropriate space afforded between a part of the cover member 56 and, for example, the reveal of a window may provide for the inflow of air to the space between the cover member and housing, although it will be appreciated that the cover member 56 could alternatively be provided with a grille or grating providing for such flow.

If a greater flow of air is required than can be provided by a single fan unit, it would be possible to provide two or more fan units in a single housing or in two housings disposed close to one another in the reveal of a window or door. They could be arranged to communicate with respective openings in the window or door frame, or with a single opening common to them.

In all the embodiments above described, the fan unit or units provides airflow from the interior of a room to the exterior thereof. If airflow in the opposite direction is required, one or more further fan units may be provided communicating with respective openings so as to provide for such reversed airflow when the or each further fan is in operation. It will be appreciated that centrifugal fan units as above described are essentially uni-directional devices: they do not provide for reverse flow of air if the direction of rotation in which they are driven is reversed.

Yet a further possibility is that a fan assembly in accordance with the invention may provide for circulation of air from the interior of a room, through



the assembly, and back to the interior of the room without any communication with the atmosphere externally of the room. Such recirculating air might be arranged to pass through filters or the like in order to remove dust or pollen, heat or cool it, or otherwise condition it for example by heating it, cooling it, or altering its humidity.

Referring now to Figure 5 of the drawings, this shows an embodiment comprising a housing 60 containing, at its opposite ends, two fan units 61, 62. Each fan unit is a centrifugal fan unit as above described, with a downwardly facing inlet which is illustrated and a tangentially extending outlet. The outlet 63 of the fan unit 61 leads into a space within the housing bounded by a curved internal wall 64 and leading to an aperture not shown in a wall of the housing facing a frame member 65. The external opening of an aperture through the frame member 65 and communicating with the aperture in the housing is indicated at 66. A curved guide vane 67 in the passage for flow of air from the fan unit 61 is also shown in the drawing.

The fan unit 62 has an outlet 68 leading to an aperture 69 in the rear wall of the housing 60 remote from the frame member 65. A cover member 70 is adapted to be removably secured to the housing 60, the cover member 70 being in the form of an upwardly open shallow trough-like member which is removably fitted, e.g. by appropriate fasteners, not shown, to the housing 60. The cover 70 has an inlet grille 71 which faces the inlet of the fan unit 62, and is connected thereto by a short length of pipe or conduit. The cover member 70 further has, on its upstanding rear wall portion 72, a closable vent fitting 73 which faces the aperture 69 and is able to be manually opened or closed, levers 74 being shown for this purpose. The cover member 70 is shaped and dimensioned so as to define a space between it and the housing 60, leading to the inlet of the fan unit 61.

When the fan unit 61 is in operation, the flow of air is caused to take place from the interior of a room in the reveal of whose window the assembly is disposed to the atmosphere externally of the room. When the fan unit 62 is

operated, a recirculatory flow of air is caused to take place with extraction of air from the interior of the room through the grille 71 and return thereof to the room through the vent fitting 73. An alternative possibility is that, if there were no airtight or substantially airtight connection between the inlet of the fan unit 62 and the grill 71 of the cover 70, operation of the fan unit 62 could draw air through the fan unit 61 in the reverse direction of its normal flow therethrough, and thus cause air to be drawn from the external atmosphere to the interior of the room.

As above referred to, a fan assembly in accordance with the invention may incorporate filter means for filtering of air being extracted from or directed to a room, or being recirculated within a room without external communication. Such filter means, e.g. mechanical filters or electrostatic filters, may provide for removal of particles such as dust or pollen from the flowing air. Other means for treating the air may be provided, e.g. by heating or cooling it, humidifying or dehumidifying it, ionising it, and so on. A heat exchanger may be incorporated. It will be appreciated that other features may be incorporated in a fan assembly in accordance with the invention, examples of such features are:

Timing means may be provided whereby a fan can be caused to operate during predetermined hours of day or night, or for a predetermined period of time after having been started manually or in response to some other parameter examples of which are given below;

Detection means, e.g. an infra-red or other sensor may be provided for detecting when a room is occupied and thereby causing a fan to be started;

Detection means for one or more of atmospheric conditions, e.g. heat or humidity may be provided for causing a fan to be brought into operation or stopped as required;

A battery or batteries, e.g. rechargeable batteries, may be incorporated in or in association with the assembly, providing for operation of a fan or fans. Solar-powered charging means for rechargeable batteries may be provided;

Appropriate means may be provided for reduction of sound emitted by the assembly in use and/or for reduction of sound transmitted by the unit between opposite faces of the windows or door, e.g. to reduce the effect of external noise inside a building.

The assembly may include means providing for fire-retardation, e.g. by preventing communication between the interior and exterior of a room in the event of fire. Means operable automatically in response to detection of heat and/or smoke may be provided to prevent flow of smoke or hot gases through the assembly. Further a heat and/or smoke detector may be provided to operate an alarm in response to such detection.

Control means for controlling operation of the assembly may be provided on the assembly itself or remotely-operable control means may be provided. The control means may provide for variable-speed operation of the one or more of the fan units in the assembly.

Yet further possibilities are that a fan assembly in accordance with the invention may be provided with features which are not directly connected with the ventilation function thereof, but otherwise might characteristically be provided in association with a window. For example, detectors for a security or alarm system could be provided. A curtain track or blind system could be provided. In this case, while as above described it is preferred that an assembly in accordance with the invention should fit entirely or substantially entirely within the reveal of a window or door, it may be advantageous for the assembly to protrude to some extent so that a curtain track, for example, is correctly positioned in relation to the window or door. Normal service and/or emergency lighting could be provided for. A fire escape ladder could be provided in association with the assembly.

Thus the invention provides for the extremely neat and compact disposition of ventilation equipment and possibly equipment for many other purposes, in association with a window or door.

In accordance with another aspect of the invention, it would be possible for a housing which may be generally as above described including one or more of the additional features above referred to, for example lighting equipment, but not having a fan or fans, to be provided with a curtain track or blind system or the like. Thereby a window or door may be provided with an assembly providing a number of functions and of neat appearance.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

**CLAIMS:-**

1. A ventilation fan assembly comprising a housing adapted to be mounted in a reveal of a window of a door adjacent a frame member of a window or door; the housing having aperture means and including fan means for causing air flow through the aperture means and thus air flow in the atmosphere ambient the housing.
2. A fan assembly according to Claim 1 wherein the housing has first and second aperture means adapted to lie in communicating relationship respectively with an opening extending through said frame member for air flow therethrough and with the atmosphere ambient the housing, the fan means being arranged to cause air flow between said first and second aperture means.
3. An installation of a ventilation fan assembly in association with a window or door, the window or door being a peripheral frame disposed in a wall and providing a reveal; the ventilation fan assembly comprising a housing disposed in said reveal adjacent a member of said peripheral frame, and having aperture means and fan means for causing air flow through the aperture means and fan means for causing air flow through the aperture means and thus for causing air flow in the atmosphere ambient the housing.
4. An installation according to Claim 3 wherein the frame member has an opening extending through it between opposite faces of the window or door, the fan assembly housing comprising first and second aperture means respectively in communicating relationship with said opening and with the atmosphere ambient the housing, the fan means being operable to cause air flow between said first and second aperture means and thus between the atmosphere ambient the housing and that at the face of the window or door opposite that where the housing is installed.

5. A fan assembly or installation according to any one of the preceding claims wherein the housing has dimensions such that it fits in the reveal of the window or door adjacent the frame member and does not extend into the window or door area more than does the frame member.
6. A fan assembly or installation according to any one of the preceding claims wherein the housing is or includes a trough-like member having an open upper part which, when installed, is closed by the reveal of the window or door.
7. A fan assembly or installation according to any one of Claims 1 to 5 wherein the housing is or includes a trough-like member having an upper part closed by a closure member, to define a path for flow of air through the housing.
8. A fan assembly or installation according to any one of the preceding claims comprising a cover member removably fitted to the housing and providing an appearance compatible with the window or door in relation to which the fan assembly is or is to be installed.
9. A fan assembly or installation according to Claim 8 wherein said cover member, when fitted, affords at least one path of flow of air relative to the aperture means of the housing.
10. A fan assembly or installation according to any one of the preceding claims wherein the fan means comprises at least one centrifugal fan, the or each thereof including a rotary element which is of relatively large diameter and small height, rotatable about an axis parallel or substantially parallel to the plane of the window and perpendicular to the reveal thereof.
11. A fan assembly or installation according to any one of the preceding claims wherein the fan means operates on a low voltage electrical power supply.

12. A fan assembly or installation according to Claim 11 further comprising battery means for powering the fan means.

13. A fan assembly or installation according to any one of Claims 10 to 12 comprising two or more fans arranged to cause flow of air in the same sense as one another.

14. A fan assembly according to any one of Claims 10 to 12 including two or more fans at least one of which is arranged to cause air flow in the opposite sense from another fan or fans.

15. A fan assembly or installation according to any one of the preceding claims adapted to provide for circulation of air by extraction thereof from the atmosphere ambient the housing, through the assembly, and return to the atmosphere ambient the housing.

16. A fan assembly or installation according to Claim 15 incorporating two or more fans one of which is adapted to cause said circulation of air whilst the or each other fan is adapted to cause a different flow of air.

17. A fan assembly or installation according to any one of the preceding claims, comprising means for treating air flowing in the assembly.

18. A fan assembly or installation according to Claim 17, wherein said means for treating the air comprises one or more of filter means, heating means, cooling means, humidifying or dehumidifying means.

19. A fan assembly or installation substantially as hereinbefore described with reference to the accompanying drawings.

20. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.



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FIG 1

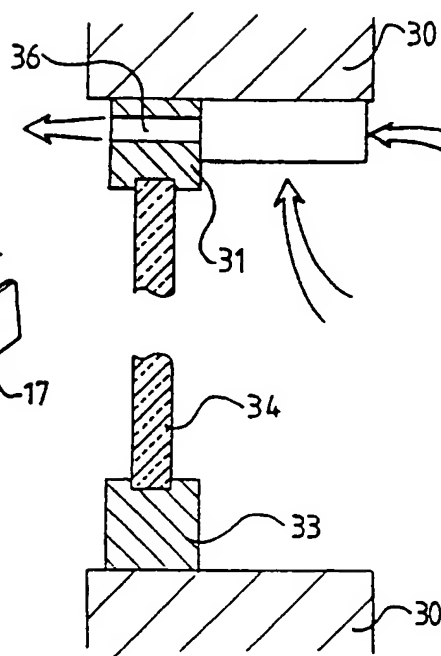
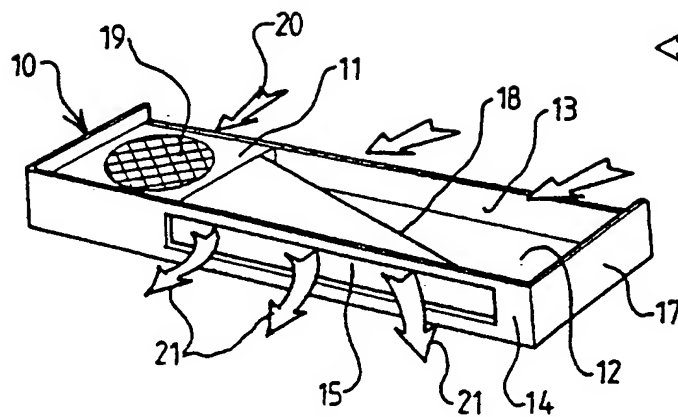


FIG 3

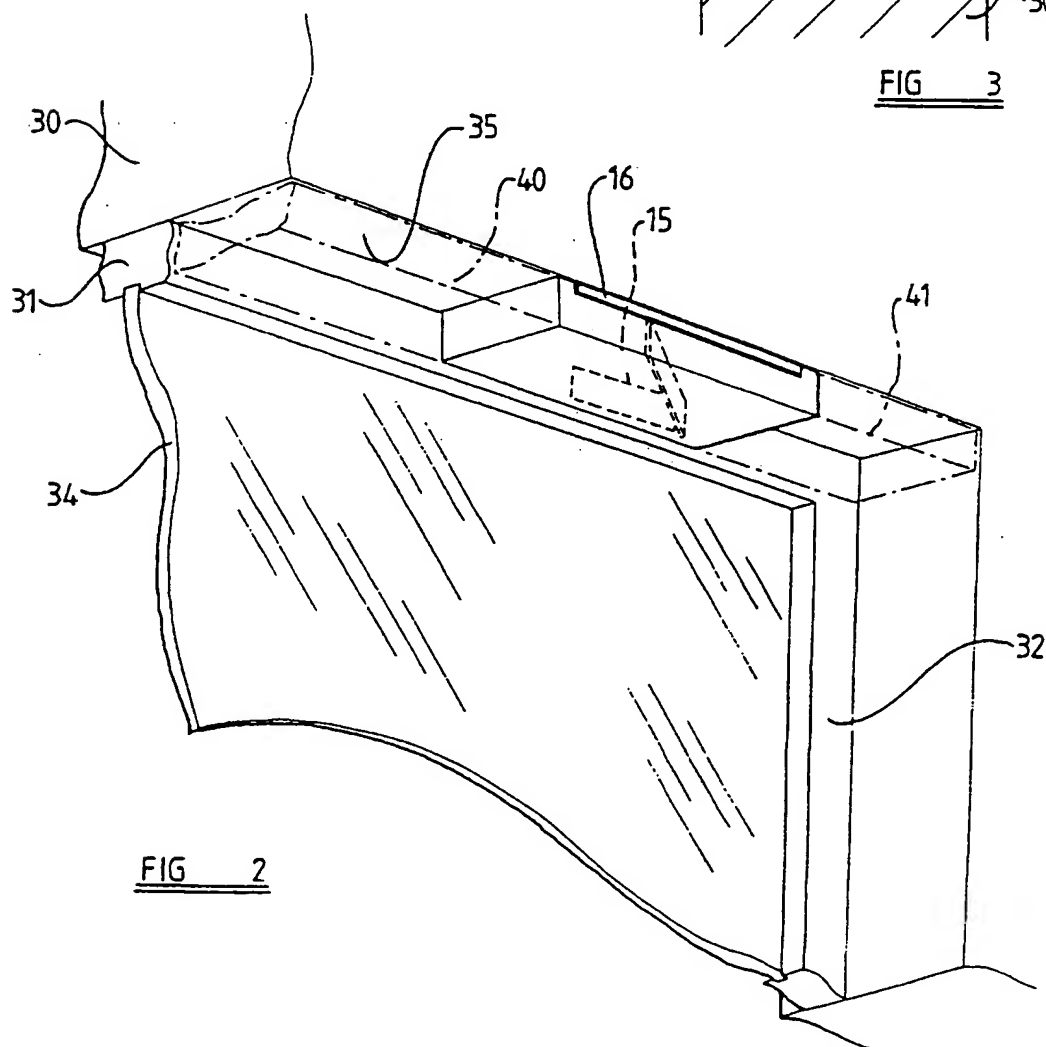
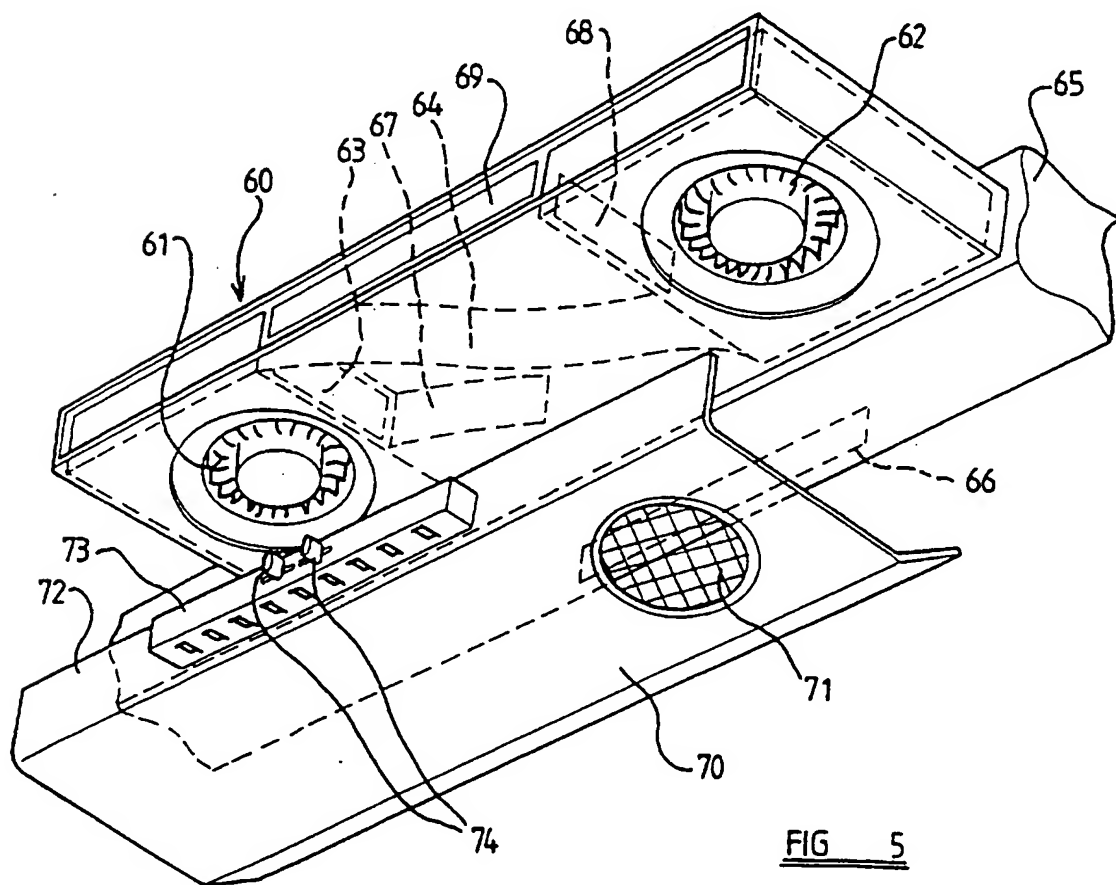
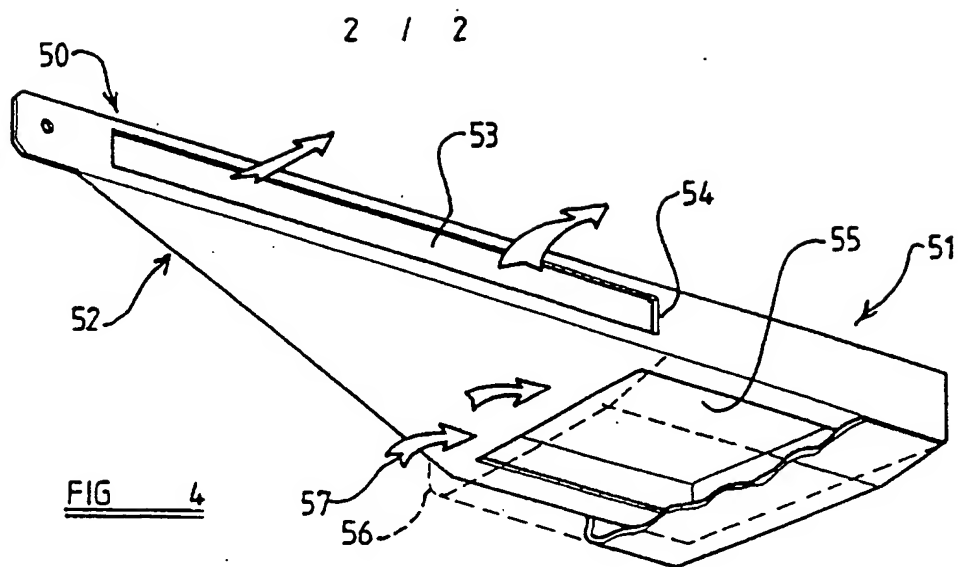


FIG 2



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 97/00982

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 F24F13/18

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F24F E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 0 372 597 A (RASMUSSEN KANN IND AS) 13 June 1990 see the whole document	1-4, 19, 20 5-8, 10, 11, 15
A	EP 0 649 970 A (SMITHS INDUSTRIES PLC) 26 April 1995 see abstract; figures	1, 3, 19, 20
A	DE 33 47 028 A (GRESCHBACH IND GMBH & CO) 4 July 1985 see abstract; figure 1	1, 3, 17

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
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- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*&\* document member of the same patent family

Date of the actual completion of the international search

1 July 1997

Date of mailing of the international search report

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Gonzalez-Granda, C

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 97/00982

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0372597 A	13-06-90	CA 2002780 A JP 2183042 A US 5046407 A	11-05-90 17-07-90 10-09-91
EP 0649970 A	26-04-95	GB 2283041 A	26-04-95
DE 3347028 A	04-07-85	NONE	